

**Capt. Jennifer Kirby discusses satellite operations with Staff Sgt. Jason Boswell** in the 2nd Satellite Operations Squadron operations center — also called the “Fishbowl” — at Schriever AFB, Colo.

The center is responsible for the Global Positioning System satellite constellation and ensuring Y2K compliance.



*With the Global Positioning System tied into so much of society, Air Force Space Command is ensuring Y2K will leave its navigation satellites ...*

## All in Good Time

by Tech. Sgt. George Hayward  
photo by Tech. Sgt. Lono Kollars

If the paranoid doomsayers are right, one second after the stroke of midnight on Dec. 31, 1999, computers around the globe will go postal, plunging the world into a black hole of cyberspace chaos.

But it could be even worse than they think. If a constellation of 27 satellites orbiting at 11,000 miles above the earth lose track of Y2K time, hikers, truckers and airliners could find themselves lost in space.

The Global Positioning System constellation of satellites, operated by Air Force Space Command's 2nd Space Operations Squadron at Schriever Air Force Base, Colo., provides three-dimensional navigation data, including longitude, latitude, altitude and speed, anywhere in the world. The constellation's first satellites were launched in the early 1980s for military use. But today, GPS receivers are available on store shelves, and government agencies, international corporations and even every-

day citizens rely on their navigation accuracy.

That accuracy is based on atomic clocks inside each satellite and ground control stations. A bite of the millennium bug could be technologically or economically fatal to anyone relying on GPS, but the Air Force is confident that reliability will continue even across the dreaded Y2K horizon.

"GPS is a national system, but it's used by many agencies outside the Department of Defense," said 1st Lt. Mike Stapleton, chief of the Y2K transition team for the 2nd Space Operations Squadron. "So the impacts of a problem would be very high. But we feel very strongly that Y2K will be more or less a nonevent."

They feel that way after several Y2K tests in the spring and early summer. Two different "species" of GPS satellites, Block IIA and Block IIR, were tested, as were GPS ground stations and a mainframe computer in the system's master control station at Schriever.

Stapleton's squadron changed the systems, resetting them to four specific dates that had potential to send a confused constellation into techno-chaos. After a number of mission operations before and after the newly programmed dates, the squadron gave the data to the Space Warfare Center's 17th Test Squadron for analysis.

"And everything looked fine. The system performed as expected," said Capt. Chris Eagan, the 17th Test Squadron's Y2K test manager.

The tests were a challenge to the squadrons because orbiting space systems like GPS have no "spare parts." GPS gets its accuracy by drawing on signals from four satellites simultaneously, but the testers couldn't take four operational satellites off-line. And they were conducting their tests during the peak of Operation Allied Force, which featured aircraft and even precision-guided munitions steered by GPS data.

"Everything we did had to have no impact on our operational GPS, so we had to develop a way of testing the system with only one satellite," Eagan said.

In addition to the Y2K rollover and two dates around the 2000 leap year, the squadrons also tested a GPS-specific calendar milestone with equally dangerous potential.

When the satellites' internal counters were set in 1980, they were based on a binary computer system, Stapleton explained. Like an automobile's odometer, the counters have a finite amount of clicks until they reset to zero — 1,023 weeks worth of clicks. In August, GPS ended its first "epoch" of 1,023 weeks. This "end of week" rollover was expected to have the same effect on GPS as the arrival of Y2K, so even after the system passed its spring and summer tests, the space community watched anxiously in August when that 1,023rd week clicked back to zero.

They were elated when nothing happened.

"It was pretty much a non-event. We watched the clock roll over and everything worked perfectly," said Michael Filler, a GPS technical support contractor for Air Force Space Command.

Officials expect the same to be true when the millenium clocks roll, too. ✪